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SEARCH REPORT
EIC-2800

STIC Database Tracking Number: 316047

To: Elias Ullah
Location: JEF 7 B 69
Art Unit: 2892
Date: 12-04-09
Case Serial Number: 10/507,392

From: Samir Patel
Location: EIC2800
JEF 04-A-70
Phone: (571) 272-23537
Samir.patel@uspto.gov

Search Notes

Dear Examiner:

Please find attached the results of your search for the above-referenced case. The search was conducted in Google, Dialog Foreign Patent databases (JPO, Derwent, French Patents), Dialog Non- Patent Literature Files.

I have listed *potential* items of interest in the first part of the search results. The Search Histories are included at the end of this file.

If you have any questions about the search, or need a refocus, please do not hesitate to contact me.

Thank you for using the EIC, and we look forward to your next search!

Samir Patel

Note: EIC-Searcher identified "potential items of interest" are selected based upon their apparent relevance to the terms/concepts provided in the examiner's search request.

316047

STIC Scientific and Technical Information Center

EIC 2800
SEARCH REQUEST

SIRA Delivering Technologies for Patents

Today's Date DEC 2 2009

Name Ellias Ullah

AU/Org. 2892 Employee # 82021

Bld.&Rm.# Jef. 7B69 Phone 2-1415

Priority App. Filing Date —

Case/App. # 10/507392

Format for Search Results

EMAIL ✓ PAPER ___

If this is an Appeals case, check here ☐

Describe this invention in your own words

Synonyms

Additional Comments

Please submit completed form to your EIC.

STIC USE ONLY 01/09

Searcher Samir Patel Date Completed 12/04 11:30a.m

Phone 2-3537 Sources Dialog, Google

Jackson, Diane DEC 2 2009 316047

From: STIC-EIC2800@uspto.gov
Sent: Wednesday, December 02, 2009 12:35 PM
To: Ullah, Elias (AU2892)
Cc: STIC-EIC2800
Subject: Confirmation Receipt: 2800 Search Request - 10507392

This is an automated email confirming that your 2800 Search Request has been received by STIC's EIC2800.

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Requester --

Name: **ULLAH, ELIAS**
Organization: **TC 2800**
Art Unit: **2892**
Employee Number: **82021**
Office Location: **JEF-7B69**
Phone Number: **(571)272-1415**
Email: **elias.ullah@uspto.gov**

Request Detail --

Attachment: **No**

Case/Application number: **10507392** PALM
Priority App. Filing Date: 2002 March 12 or March 12 2003
Format for Search Results: **EMAIL**
Board of Appeals Case?: **No**

Describe this invention in your own words.:
laser cut , within or inside substrate or object

Synonyms:

Additional Comments:

Request Date: **Wednesday, December 2, 2009 12:34 PM**

I. Potential items of Interest from multiple databases

14/3,AB/8 (Item 6 from file: 350)
DIALOG(R)File 350: Derwent WPIX
Related WPI Acc No: 2003-667564; 2008-H08224
Nitride semiconductor device manufacture, e.g. LED and laser diode production - involves forming break line at base of each groove by laser irradiation, through which separation of substrate is carried
Patent Assignee: NICHIA KAGAKU KOGYO KK (NHIC)
Inventor: SHONO H; TOYODA T
Patent Family: 2 patents, 1 countries

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
JP 11177137	A	19990702	JP 1997345937	A	19971216	199937	B
JP 3604550	B2	20041222	JP 1997345937	A	19971216	200501	E

Alerting Abstract JP A
NOVELTY - A semiconductor nitride film pattern (102) is formed on the lower surface (121) of a substrate (101). Multiple grooves (103) are cut suitably in the upper surface (111) of the substrate (101). A break line (104) is drawn from the base of each grooves by laser irradiation, through which the substrate is divided into many pieces.
USE - For manufacturing nitride semiconductor, e.g. LED and laser diode.
ADVANTAGE - Since division of substrate is done along break line, product supply shape and yield are improved. Since break line is formed by non-contact, degradation of former scribe cutter and reduction in cost is promoted. Since substrate is divided through groove in substrate, there is no damage produced to semiconductor during division. Therefore, reliability of element is improved. Break line is formed by laser irradiation. Therefore semiconductor nitride serves as semiconductor wafer.
ADVANTAGE - DESCRIPTION OF DRAWING - The figure is a sectional view of process involved in separation procedure of semiconductor wafer. (101) Substrate; (102) Semiconductor nitride film pattern; (103) Groove; (104) Break line; (111) Upper surface; (121) Lower surface.

1. Original Publication Data by Authority

Original Abstracts:
This invention is related to the manufacturing method of the light emitting diode which can light-emit from a ultraviolet region to an orange, a laser diode, and the 3-5 group semiconductor element which can be further driven also in high temperature. Specifically, It relates to the manufacturing method which divides the nitride semiconductor element on a board|substrate from the semiconductor **wafer** by which the nitride semiconductor **lamination**|stacking was carried out.This invention forms the groove part which reaches the board|**substrate** of a semiconductor **wafer**, The **break** * line by **laser** irradiation is formed at the groove part. Width enables more highly accurate break * line formation which does not have the processing variation in a trench part narrowly, without this causing deterioration of the processing precision by blade-tip exhaustion etc., The nitride semiconductor element can be divided along a break * line easily and correctly. Therefore, the product supply to which the shape was equal, and the improvement of the product yield can be performed.

Basic Derwent Week: 199937

14/3,AB/13 (Item 11 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0002137133
WPI Acc no: 1981-23860D/
Wafer for semiconductor laser elements is separated - by scribing and cracking to form flat mirror surfaces for resonator
Patent Assignee: FUJITSU LTD (FUIT)
Inventor: FUJIWARA K; FUJIWARA T; OHSAKA S; OSAKA S
Patent Family: 5 patents, 13 countries

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
EP 25690	A	19810325	EP 1980303170	A	19800910	198114	B
US 4306351	A	19811222	US 1980185810	A	19800910	198202	E
EP 25690	B	19850327	EP 1980303170	A	19800910	198513	E
DE 3070384	G	19850502				198519	E
JP 56040291	A	19810416	JP 1979116002	A	19790910	199049	E
			JP 1979116002	A	19790910		

Alerting Abstract EP A
A method is described for producing a semiconductor laser element having a double hetero (DH) structure of the GaAs-GaI-xAlxAs system. The laser has an active layer of p.type gallium arsenide having a smaller band gap than clad layers on either side of it. The opposite surfaces of the element are formed as mirror surfaces by cleavage. The crystal surface at right angles to the crystal surface of orientation is the cleavage surface. To separate the wafer it is scribed to form scratches over the surface, except in the light emitting region. The wafer is then stressed along the lines of the scratches to form minute cracks extending internally of the substrate from the scribed lines..
The cleaved surface formed by cracking along a scribe line is very flat in areas in which the light-emitting regions are exposed.

2. Original Publication Data by Authority

Original Abstracts:

A method of producing a semiconductor laser element, and a semiconductor laser element so produced.
A wafer for forming semiconductor laser elements is scribed along scribe lines 10 with a scriber 11. Scratches are formed in the top surface of the wafer along the scribe lines except in regions of the top surface above light emitting regions 3' of the laser elements. The absence of scratches in the top surface above regions 3' means that minute cracks 12 such as are formend in the wafer under scratched parts of the top surface are not formed in the regions 3'. The **wafer** is **cracked** along **the** scribe lines, and a flat surface effective as a **laser** resonator mirror is formed at the end of light emitting region 3'.
Protection film 9, of gold for example, laid over light emitting regions 3' before scribing and over which scribing takes place,

26/3,AB/1 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0016716427
WPI Acc no: 2007-431509/
Related WPI Acc No: 2003-200600; 2004-624050
XRAM Acc no: C2007-156413
XRPX Acc No: N2007-324656
In-line system for fabricating liquid crystal display, has substrate cutting unit illuminating laser beam onto substrates using cutter to form minute crack at substrates for severing substrates into cell regions
Patent Assignee: CHOO D (CHOO-I); KWON Y (KWON-I); LEE S (LEES-I)
Inventor: CHOO D; KWON Y; LEE S
Patent Family: 1 patents, 1 countries

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20070056686	A1	20070315	US 2002108045	A	20020327	200741	B
			US 2004762436	A	20040122		
			US 2006554682	A	20061031		

Alerting Abstract US A1
NOVELTY - The system has a spacer dispersing unit (200) for dispersing spacers onto a bottom substrate maintaining a gap between the bottom and top **substrate**. A sealer **coating** unit (300) coats a sealer onto the bottom substrate, and a sealer hardening unit (900) hardens the sealer. A liquid crystal injection unit (400) drops a liquid crystal onto the coated substrate. A substrate cutting unit (1100) illuminates a laser beam onto the substrates along the cutting lines using a cutter to form a minute **crack** at the **substrates** for severing the substrates into liquid crystal display unit cell regions.
DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of fabricating a liquid crystal display.
USE - Used for fabricating a liquid crystal display (claimed).
ADVANTAGE - The substrate cutting unit illuminates the **laser** beam onto the substrates using the cutter to form a minute **crack** at the **substrates** for severing the substrates into the liquid crystal display unit cell regions, so that the laser-based cutter does not contact the substrates and does not apply pressure to the substrates, thus preventing causing of stress in the substrates. The system prevents the deformation of the liquid crystal display cell, and deterioration of the liquid crystal and the alignment films, thus enhancing display characteristics in the liquid crystal display in a stable manner.
DESCRIPTION OF DRAWINGS - The drawing shows a block representation of an in-line system.

3. Original Publication Data by Authority

Original Abstracts:
An in-line system for fabricating a liquid crystal display includes a sealer coating unit for **coating** a sealer onto a first **substrate** with a plurality of liquid crystal display cell regions a liquid crystal injection unit for dropping a liquid crystal onto the first substrate coated with the sealer, and an assembly unit for assembling the first substrate with the second substrate, A sealer hardening unit hardens the sealer interposed between the first and the second substrate to thereby assemble the first and the second substrate with each other. A substrate cutting unit cuts the first and the second substrates along cutting lines through illuminating a laser beam along the cutting lines such that the first and the second substrates are severed into the liquid crystal display cell regions.

Basic Derwent Week: 200741

14/3,AB/3 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX
Related WPI Acc No: 1999-436037; 2008-H08224

Nitride semiconductor element manufacturing method involves forming recess in groove formed at one surface of semiconductor wafer, by laser irradiation, by which wafer is divided into elements

Patent Assignee: NICHIA KAGAKU KOGYO KK (NHIC)
Inventor: SHONO H; TOYODA T
Patent Family: 2 patents, 1 countries

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
JP 2003218065	A	20030731	JP 1997345937	A	19971216	200363	B
			JP 2002329878	A	19971216		
JP 4244618	B2	20090325	JP 1997345937	A	19971216	200922	E
			JP 2002329878	A	20021113		

Alerting Abstract JP A

NOVELTY - An insulating layer (102) is formed at the surface (121) of a semiconductor wafer (100). Grooves (103) are formed at the surface (111) of the wafer. Laser is irradiated on the groove, to form a recess (104). The wafer is divided into semiconductor elements (110), along the recess.
USE - For manufacturing nitride semiconductor element such as laser diode.
ADVANTAGE - Since the recess is formed narrower than the groove, the recess is formed easily at the desired depth. Hence the wafer is divided into elements, easily and accurately. The shape of the elements are even and yield is improved.
Original Publication Data by Authority

Original Abstracts:

This invention relates to the manufacturing method of the light emitting diode which can light-emit light from an ultraviolet region to an orange, a laser diode, and also 3 -5 group semiconductor element which can be driven also in high temperature.Specifically,It is related with the manufacturing method which divides|segments the nitride semiconductor element on a board|substrate from the semiconductor **wafer** by which nitride semiconductor **lamination**|stacking was carried out.This invention forms the groove part which reaches the board|substrate of a semiconductor **wafer**, and forms the **break** line by **laser** irradiation in the groove part.Width enables more highly accurate break line formation which does not have processing variation in a trench part narrowly, without this causing deterioration of the processing precision by blade edge|tip exhaustion etc.,The nitride semiconductor element can be divided|segmented along a break line easily and correctly.Therefore, the product supply to which the shape was equal, and the improvement of a product yield can be performed.

Basic Derwent Week: 200363

14/3,AB/5 (Item 3 from file: 350)
DIALOG(R)File 350: Derwent WPIX
Separation of non-metallic substrate along separation line by forming micro crack in the substrate and controlling propagating the micro crack
Patent Assignee: HOEKSTRA B L (HOEK-I)
Inventor: HOEKSTRA B L
Patent Family: 1 patents, 1 countries

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 6420678	B1	20020716	US 1998110533	P	19981201	200267	B
			US 1999240058	A	19990129		

Alerting Abstract US B1
NOVELTY - Separation of non-metallic substrate along a separation line (45) involves generating an incident beam of coherent energy, splitting at least a portion of the beam to form two distinct beams of coherent energy, directing at least a portion of each beam onto the substrate, projecting a coolant stream onto the substrate, and moving the beams and coolant stream relative to the substrate.
DESCRIPTION - Separation of non-metallic substrate along a separation line by propagating a micro crack involves generating an incident beam of coherent energy; splitting at least a portion of the beam to form first and second distinct beams of coherent energy; directing at least a portion of each of the first and second beams onto the substrate to impinge at separate respective first and second beam spots; projecting a coolant stream onto the substrate so that the coolant stream contacts the substrate at a cooling locality; moving the beams and coolant stream relative to the substrate so that the first and second beam spots and the cooling locality move across the substrate, where the splitting step causes the beam spots to be separated from each other in a direction along the separation line; and splitting the second beam into distinct beam portions that impinge upon the substrate at the second beam spot and a third beam spot which are located on opposite sides of the separation line.
USE - The method is used for the separation of a non-metallic substrate along a separation line.
ADVANTAGE - The inventive method is easily adaptable for many applications, achieves fast cutting speeds and total separation of the substrate, and eliminates the need for secondary operations.
Technology Focus
METALLURGY - Preferred Method: The projecting step includes projecting the coolant stream at a locality between the first, second, and third beam spots; or at a locality at a trailing end of the first beam spot. The second splitting step includes placing a faceted lens in the path of the second beam. The substrate is split along a separation line and a heat affected zone on the **substrate** exists **covering** the separation line and a small heat affected area on both sides of the separation line. The method further comprises preheating only the heat affected zone by a source beam of coherent radiation emitted from a laser and directing the source beam from the **laser** to form the first beam. A micro **crack** is initiated by engaging the **substrate** with a rotatable wheel.

INORGANIC CHEMISTRY - Preferred Material: The coolant stream includes a stream of helium gas void of water.

4. **Original Publication Data by Authority**

Original Abstracts:
A method for physically separating non-metallic substrates by forming a microcrack in the substrate and controllingly propagating the microcrack. An initial mechanical or pulsed **laser** scribing device forms a **microcrack** in the **substrate**. If a pulsed **laser** is used, it forms a **crack** in the **substrate** between its top and bottom surfaces. A scribe beam is applied onto the substrate on a separation line. A helium coolant stream intersects with, or is adjacent to, the trailing edge of the scribe beam. The temperature differential between the heat affected zone of the substrate and the coolant stream propagates the microcrack. Two breaking beams on opposing sides of the separation line follow the coolant stream. The breaking beams create controlled tensile forces that extend the crack to the bottom surface of the substrate for full separation. The scribe and break beams and coolant stream are simultaneously moved relative to the substrate. A preheat beam preheats the heat affected area on the substrate. The beams are formed by an arrangement of lasers and mirrors and lenses. A movable mirror selectively diverts a beam to form either the preheat beam or one or more of the break and scribe beams. Spherical aberration is introduced in the break and scribe beams to flatten their energy distribution profiles and evenly apply the beam energy. A supplemental mechanical force, applied by vertically movable wheels or by restraining the substrate against a curved frame, creates a bending moment to facilitate the separation process.

Basic Derwent Week: 200267

20/3,AB/1 (Item 1 from file: 347)
DIALOG(R)File 347: JAPIO

07552337 **METHOD OF MANUFACTURING SEMICONDUCTOR LASER**

Pub. No.: 2003-046177 [JP 2003046177 A]
Published: February 14, 2003 (20030214)
Inventor: YAJIMA HIROYOSHI
YAMANAKA KEIICHIRO
KATO MAKOTO
ISHIBASHI AKIHIKO
Applicant: MATSUSHITA ELECTRIC IND CO LTD
Application No.: 2001-232788 [JP 2001232788]
Filed: July 31, 2001 (20010731)

ABSTRACT

PROBLEM TO BE SOLVED: To provide a method of manufacturing a semiconductor laser by which the manufacturing yield of the semiconductor laser can be improved by obtaining an optical resonator composed of a good cleavage plane without changing the characteristics of a compound **semiconductor laminate** by suppressing the occurrence of defects, such as cracking, chipping, etc., in a laser scribing method.

SOLUTION: Ultrashort pulsed laser light 31 is projected upon a **laminated substrate** composed of a single-crystal oxide **substrate** 1 and the compound **semiconductor laminate** 10 having a stripe-like light emitting region perpendicularly to the stripe of the laminate 10 from the laminate 10 side. The wavelength of the laser light 31 is transparent to the **laminate** 10 and **substrate** 1. Consequently, a **semiconductor laser** element in which such **defects** as cracking, chipping, etc., do not occur and the characteristics of the laminate 10 do not change can be obtained by scribing 32 and 34 the incident plane and the plane opposite to the incident plane and cleaving (not shown in the figure) the planes.

14/9/4 (Item 4 from file: 2)
DIALOG(R)File 2: INSPEC

08326287
Title: **Laser processing of ZrO_2 coatings**
Author(s): Ilyuschenko, A.Ph.; Okovity, V.A.; Tolochko, N.K.; Steinhauser, S.
Author Affiliation: Powder Metall. Res. Inst., Minsk, Belarus
Journal: Materials and Manufacturing Processes , vol.17 , no.2 , pp.157-67
Publisher: Marcel Dekker
Country of Publication: USA
Publication Date: 2002
ISSN: 1042-6914
SICI: 1042-6914(2002)17:2L.157:LPZC;1-N
CODEN: MMAPET
U.S. Copyright Clearance Center Code: 1042-6914/02/$10.00
Language: English
Document Type: Journal Paper (JP)
Treatment: Experimental (X)
Abstract: Potential materials for protective heat-resistant coatings are the so-called fragmentary porous ceramic layers penetrated by a net of microcracks. The fragments can be shifted easily during thermal cycling procedure, and the micro-cracks prevent the throughout crack propagation, which could destroy the coating. **Laser** surface processing of coatings is one of the effective ways to form the fragmentary layered structure. The peculiarities of **laser** processing of ZrO_2+Y_2O_3 plasma sprayed **coatings** deposited onto the steel **substrate** with the Ni-Cr-Al-Y sub-layer alloy were investigated. The coatings were processed by CW CO_2 and Nd:YAG **lasers**. The **laser** processing resulted in melting of the coating surface. The modified coating consisted of a number of macro fragments with sizes 200-500 mum and in turn they consisted of a number of micro-fragments with sizes 20-70 mum. Both types of the fragments are separated by wide (10-15 mum) or narrow (1-5 mum) cracks accordingly. The structure and some properties of the modified coatings such as heat-resistance, hardness, surface roughness, and tightness are investigated depending on the **laser** output parameters (*5 refs.*)
Subfile(s): A (Physics)
Descriptors: ceramics; crack-edge stress field analysis; hardness; **laser** hardening; microcracks; porous materials; rough surfaces; surface topography; thermal barrier coatings; zirconium compounds
Identifiers: protective heat-resistant coatings; fragmentary porous ceramic layers; microcracks; thermal cycling procedure; **crack** propagation; **laser** surface processing; steel **substrate**; Ni-Cr-Al-Y sub-layer alloy; continuous wave Nd:YAG **laser**; melting; coating surface; modified coating; macro fragments; micro-fragments; structure; properties; heat-resistance; hardness; surface roughness; surface tightness; **laser** output parameters; ZrO_2 coatings; ZrO_2+Y_2O_3 plasma sprayed coatings; continuous wave CO_2 **laser**; YAG:Nd; Ni-Cr-Al-Y; CO_2; ZrO_2-Y_2O_3; YAl5O12:Nd
Classification Codes: A8160D (Surface treatment and degradation of ceramics and refractories); A5275R (Plasma applications in manufacturing and materials processing); A6855 (Thin film growth, structure, and epitaxy); A8115R (Spray coating techniques); A6220M (Fatigue, brittleness, fracture, and cracks); A8140N (Fatigue, embrittlement, and fracture); **A4262A** (Laser materials processing)
Chemical Indexing:
YAl5O12:Nd/ss - YAl5O12/ss - Al5O12/ss - Al5/ss - O12/ss - Al/ss - Nd/ ss - O/ss - Y/ss - Nd/el - Nd/dop
NiCrAlY/sur - Al/sur - Cr/ sur - Ni/sur - Y/sur - NiCrAlY/ss - Al/ss - Cr/ss - Ni/ss - Y/ss
Fe/sur - C/sur - Fe/ss - C/ss
CO2/bin - O2/ bin - C/bin - O/bin
ZrO2Y2O3/sur - O2/sur - O3/sur - Y2/sur - Zr/sur - O/sur - Y/sur - ZrO2Y2O3/ss - O2/ss - O3/ss - Y2/ss - Zr/ss - O/ ss - Y/ss
INSPEC Update Issue: 2002-028

14/9/5 (Item 5 from file: 2)
DIALOG(R)File 2: INSPEC
Title: Simultaneous laser generation and laser ultrasonic detection of the mechanical breakdown of a coating-substrate interface
Author(s): Rosa, G.; Psyllaki, P.; Oltra, R.; Costil, S.; Coddet, C.
Journal: Ultrasonics , vol.39 , no.5 , pp.355-65
Publisher: Elsevier
Country of Publication: Netherlands
Publication Date: Aug. 2001
ISSN: 0041-624X
SICI: 0041-624X(200108)39:5L.355:SLGL;1-W
CODEN: ULTRA3
U.S. Copyright Clearance Center Code: 0041-624X/01/$20.00
Language: English
Document Type: Journal Paper (JP)
Treatment: Experimental (X)
Abstract: The aim of the present study was to investigate the longitudinal wave propagation within a transparent and porous ceramic **coating** on a metallic **substrate**, under different regimes of pulsed **laser** irradiation/material interaction (thermoelastic interactions, **fracture** of the **coating**-**substrate** interface and **coating** expulsion) but in the absence of ablation and subsequent plasma formation. For this purpose, a physical model, as well as an analytical one were developed and validated in the case of alumina **coatings** deposited on stainless steel **substrates** by atmospheric plasma spraying (APS). The very good agreement between calculated and experimental waveforms indicated the potential interest of a contactless **laser**-based technique for the non-destructive determination of the porosity and the Young modulus of transparent ceramic coatings, as well as for the estimation of their adhesion on metallic substrates, or even for the in situ control of the cleaning effectiveness of a **laser**-based technique (*43 refs.*)
Subfile(s): A (Physics); B (Electrical & Electronic Engineering)
Descriptors: acoustic field; adhesion; alumina; **laser** ablation; plasma arc sprayed coatings; stainless steel; ultrasonic materials testing; Young's modulus
Identifiers: simultaneous **laser** generation; **laser** ultrasonic detection; mechanical **breakdown**; **coating**-**substrate** interface; longitudinal wave propagation; porous ceramic **coating**; transparent ceramic **coating**; metallic **substrate**; pulsed **laser** irradiation; material interaction; thermoelastic interactions; coating expulsion; plasma formation; alumina coatings; stainless steel; atmospheric plasma spray deposition; APS; contactless **laser**-based technique; nondestructive porosity determination; Young modulus; adhesion; metallic substrates; cleaning effectiveness; Al_2O_3; FeCCr
Classification Codes: A8170B (Nondestructive testing: acoustic methods); A8115R (Spray coating techniques); A8160B (Surface treatment and degradation of metals and alloys); A4385G (Measurement by acoustic techniques); A5275R (Plasma applications in manufacturing and materials processing); **A4262A** (Laser materials processing); A6855 (Thin film growth, structure, and epitaxy); B0590 (Materials testing); B0520X (Other thin film deposition techniques); B7820 (Sonic and ultrasonic applications); **B4360B** (Laser materials processing)
Chemical Indexing:
Al2O3/bin - Al2/bin - Al/bin - O3/bin - O/bin
FeCCr/sur - Cr/sur - Fe/sur - C/sur - FeCCr/ss - Cr/ss - Fe/ss - C/ss
INSPEC Update Issue: 2002-016

14/9/6 (Item 6 from file: 2)
DIALOG(R)File 2: INSPEC

08237533
Title: High power Nd:YAG laser cladding using $MoSi_2$ powder injection
Author(s): Ignat, S.; Sallamand, P.; Nichici, A.; Vannes, B.; Grevey, D.; Cicala, E.
Author Affiliation: Fac. of Mech. Eng., Timisoara Univ., Romania
Book Title: Proceedings of the International Conference on **LASERS** 2000
Inclusive Page Numbers: 764-9
Publisher: STS Press, McLean, VA
Country of Publication: USA
Publication Date: 2001
Conference Title: Proceedings of 2000 International Conference on Lasers
Conference Date: 4-8 Dec. 2000
Conference Location: Albuquerque, NM, USA
Conference Sponsor: Soc. Opt. & Quantum Electron
Editor(s): Corcoran, V.J.; Corcoran, T.A.
Number of Pages: xiv+972
Language: English
Document Type: Conference Paper (PA)
Treatment: Experimental (X)
Abstract: High-power continuous wave **lasers** are normally employed for cladding. The **laser** radiation has been used with considerable success in achieving clad layers with thickness in the range 1 to 2 mm, in a single pass, at relatively high processing speeds. In the case of CO_2 **laser** cladding using $MoSi_2$ as the clad material, the layers are dense, with a high density of cracks due to thermal stresses induced by phase transformation and thermal gradients during **coating** manufacturing. On a steel **substrate**, a high dilution rate was also observed. Using a high-power cw Nd:YAG **laser**, we demonstrate the feasibility of the **laser** cladding technique by projecting $MoSi_2$ powder onto the steel substrate. The preliminary results indicate a low density of cracks and a dilution within the range 10 to 20%. However, increasing the dilution rate does not affect the properties of clad layers, like hardness for example. With a dilution rate of 50% we can obtain clad layers without any cracks or porosity but maintaining the hardness within the range of 1200-1300 $HV_{0.3}$ (*5 refs.*)
Subfile(s): A (Physics)
Descriptors: ceramics; cladding techniques; cracks; hardness; **laser** materials processing; molybdenum compounds; powder technology; solid **lasers**
Identifiers: high power Nd:YAG **laser** cladding; $MoSi_2$ powder injection; steel **substrate**; low **crack** density; dilution rate; clad layers; hardness; porosity; 1 to 2 mm; $MoSi_2$; YAG:Nd; YAl5O12:Nd
Classification Codes: A8160B (Surface treatment and degradation of metals and alloys); A8120L (Preparation of ceramics and refractories); A8120E (Powder techniques, compaction and sintering); **A4262A** (Laser materials processing); A8140N (Fatigue, embrittlement, and fracture); A6220M (Fatigue, brittleness, fracture, and cracks)
Chemical Indexing:
MoSi2/bin - Si2/bin - Mo/bin - Si/bin
YAl5O12:Nd/ss - YAl5O12/ss - Al5O12/ss - Al5/ss - O12/ss - Al/ss - Nd/ss - O/ss - Y/ss - Nd /el - Nd/dop
Fe/sur - C/sur - Fe/ss - C/ss
Numerical Indexing: size: 1.0E-03 to 2.0E-03 m
INSPEC Update Issue: 2002-015

14/9/9 (Item 9 from file: 2)
DIALOG(R)File 2: INSPEC

07577833
Title: **Mechanical properties of calcium phosphate coatings deposited by laser ablation**
Author(s): Cleries, L.; Martinez, E.; Fernandez-Pradas, J.M.; Sardin, G.; Esteve, J.; Morenza, J.L.
Author Affiliation: Dept. de Fisica Aplicada i Opt., Barcelona Univ., Spain
Journal: Biomaterials , vol.21 , no.9 , pp.967-71
Publisher: Elsevier
Country of Publication: UK
Publication Date: May 2000
ISSN: 0142-9612
SICI: 0142-9612(200005)21:9L.967:MPCP;1-W
CODEN: BIMADU
Document Number: S0142-9612(99)00240-9
U.S. Copyright Clearance Center Code: 0142-9612/2000/$20.00
Language: English
Document Type: Journal Paper (JP)
Treatment: Experimental (X)
Abstract: Amorphous calcium phosphate and crystalline hydroxyapatite coatings with different morphologies were deposited onto Ti-6 Al-4 V substrates by means of the **laser** ablation technique. The strength of adhesion of the **coatings** to the **substrate** and their mode of **fracture** were evaluated through the scratch test technique and scanning electron microscopy. The effect of wet immersion on the adhesion was also assessed. The mechanisms of failure and the critical load of delamination differ significantly depending on the phase and structure of the coatings. The HA coatings with granular morphology have higher resistance to delamination as compared to HA coatings with columnar morphology. This fact has been related to the absence of stresses for the granular morphology (*12 refs.*)
Subfile(s): A (Physics)
Descriptors: adhesion; aluminium alloys; amorphous state; biomechanics; biomedical materials; calcium compounds; corrosion protective coatings; delamination; fracture; **laser** ablation; **laser** applications in medicine; scanning electron microscopy; substrates; titanium alloys; vanadium alloys
Identifiers: amorphous $Ca_3(PO_4)_2$ coatings ; crystalline hydroxyapatite coatings; $Ca_{10}(PO_4)_6(OH)_2$ **coatings**; Ti-Al-V **substrates**; **laser** ablation technique; adhesion; **fracture**; scratch test technique; scanning electron microscopy; wet immersion; failure; critical load; delamination; granular morphology; columnar morphology; mechanical properties; Ti-Al-V; $Ca_3(PO_4)_2$; $Ca_{10}(PO_4)_6(OH)_2$
Classification Codes: A8770J (Prosthetics and other practical applications); A8745 (Biomechanics, biorheology, biological fluid dynamics); A6855 (Thin film growth, structure, and epitaxy); A8115 (Methods of thin film deposition); A6860 (Physical properties of thin films, nonelectronic); **A4262A** (Laser materials processing); A7920D (Laser-surface impact phenomena); A8760F (Optical and laser radiation (medical uses)); A8160B (Surface treatment and degradation of metals and alloys); A8160D (Surface treatment and degradation of ceramics and refractories)
Chemical Indexing:
TiAlV/sur - Al/sur - Ti/sur - V/sur - TiAlV/ss - Al/ss - Ti/ss - V/ss
Ca3PO4/sur - Ca3/sur - PO4/sur - Ca/sur - O4/sur - O/sur - P/sur - Ca3PO4/ss - Ca3/ss - PO4/ss - Ca/ss - O4/ss - O/ss - P/ss
Ca10PO4OH/sur - Ca10/sur - PO4/sur - Ca/sur - O4/sur - OH/ sur - H/sur - O/sur - P/sur - Ca10PO4OH/ss - Ca10/ss - PO4/ss - Ca/ss - O4/ ss - OH/ss - H/ss - O/ss - P/ss
INSPEC Update Issue: 2000-018

14/9/10 (Item 10 from file: 2)
DIALOG(R)File 2: INSPEC

07478787
Title: Microstructure and multiple-impact response of the transition region between a laser-clad Fe-Al bronze coating and its aluminum alloy substrate
Author(s): Wang Aihua; Xie Changsheng; Li Shudong; Nie Jihong
Author Affiliation: Huazhong Univ. of Sci. & Technol., Wuhan, China
Journal: Rare Metal Materials and Engineering , vol.28 , no.5 , pp.289-92
Publisher: Northwest Inst. Nonferrous Met. Res
Country of Publication: China
Publication Date: Oct. 1999
ISSN: 1002-185X
SICI: 1002-185X(199910)28:5L.289:MMIR;1-#
CODEN: XJCGEA
Language: Chinese
Document Type: Journal Paper (JP)
Treatment: Experimental (X)
Abstract: The microstructure and small energy multi-impact (SEMI) behavior of the transition region between a **laser**-clad Fe-Al bronze **coating** and its aluminum alloy **substrate** have been investigated. The results show that the transition region consists of several layers. The layer adjacent to the clad region is composed of nonuniform block-like Cu_3Al_4 and Cu_2Al phases. The middle layer is characterized by a mixed structure of block-like Cu_3Al and needle-like $CuAl_2$. In the layer near to the substrate the volume fraction of needle-like $CuAl_2$ phase decreases and volume fraction of alpha-Al phase increases when approaching to the **substrate**. Under SEMI loading, **cracks** initiate in the $CuAl_2$ phase-rich region. **Laser** scanning velocity has a significant influence on the volume fraction of $CuAl_2$, phase, and thus directly affects the SEMI resistance of the transition region. The **laser**-clad bronze coatings produced at a scanning velocity of 10 mm/s to 14 mm/s have better resistance to SEMI than those produced at higher scanning velocities (*6 refs.*)
Subfile(s): A (Physics)
Descriptors: aluminium alloys; chemical interdiffusion; cladding techniques; claddings; copper alloys; crystal microstructure; impact strength; iron alloys; **laser** deposition
Identifiers: **laser**-clad Fe-Al bronze **coating**; aluminum alloy **substrate**; transition region; multiple-impact response; microstructure; nonuniform block-like phases; mixed structure; needle-like phase; crack initiation; **laser** scanning velocity; impact resistance; phase volume fraction; Cu_3Al_4; Cu_2Al; $CuAl_2$
Classification Codes: A8160B (Surface treatment and degradation of metals and alloys); **A4262A** (Laser materials processing); A8140N (Fatigue, embrittlement, and fracture); A6220M (Fatigue, brittleness, fracture, and cracks); A6480G (Microstructure); A6822 (Surface diffusion, segregation and interfacial compound formation)
Chemical Indexing:
Al/sur - Al/ss
CuFeAl/int - Al/int - Cu/int - Fe/int - CuFeAl/ss - Al/ss - Cu/ss - Fe/ss
Cu3Al4/int - Al4/int - Cu3 /int - Al/int - Cu/int - Cu3Al4/bin - Al4/bin - Cu3/bin - Al/bin - Cu/bin
Cu2Al/int - Cu2/int - Al/int - Cu/int - Cu2Al/bin - Cu2/bin - Al/bin - Cu/bin
CuAl2/int - Al2/int - Al/int - Cu/int - CuAl2/bin - Al2/bin - Al/bin - Cu/bin
INSPEC Update Issue: 2000-004

22/9/16 (Item 3 from file: 8)
DIALOG(R)File 8: Ei Compendex(R)

0014228406 **E.I. COMPENDEX No:** 1999234632054
Experimental and theoretical/numerical investigations of thin films bonding strength

Youtsos, A.G.; Kiriakopoulos, M.; Timke, Th.
Corresp. Author/Affil: Youtsos, A.G.: European Commission, Joint Research Centre, Institute for Advanced Materials, P.O. Box 2, 1755 ZG Petten, Netherlands
Corresp. Author email: youtsos@jrc.nl
Theoretical and Applied Fracture Mechanics (Theor. Appl. Fract. Mech.) (Netherlands) 1999 31/1 (47-59)
Publication Date: 19990101
Publisher: Elsevier
CODEN: TAFME **ISSN:** 0167-8442
Publisher Item Identifier: S0167844298000664
Item Identifier (DOI): 10.1016/S0167-8442(98)00066-4
Document Type: Article; Journal **Record Type:** Abstract
Treatment: A; (Applications); T; (Theoretical); X; (Experimental)
Language: English **Summary Language:** English
Number of References: 21
A **laser** spallation facility has been developed to measure the strength of planar interfaces between a **substrate** and a thin **coating**. The technique involves impinging a **laser** pulse of ultrashort duration on the rear surface of the substrate, which is coated by a thin layer of energy absorbing metal. It is shown by mathematical simulation that atomic bond rupture is the mechanism of separation in the experiment. Several **substrate/coating** systems have been investigated such as, 1-15 mum SiC by chemical vapor deposition (CVD), 1-4 mum TiC and TiN by physical vapor deposition (PVD) **coatings** on sapphire **substrates**, as well as 1-2 mum Au, Sn and Ag coatings by sputtering on sapphire, fused quartz and glass substrates.
Descriptors: Bond strength (chemical); Coatings; Computer simulation; Interfaces (materials); **Laser** beam effects; Light absorption; Spalling; **Substrates**; Ultrafast phenomena; ***Fracture** mechanics
Identifiers: Laser spallation; **Substrate/coating** systems
Classification Codes:
741.1 (Light & Optics)
744.8 (Laser Beam Interactions)
813.2 (Coating Materials)
931.1 (Mechanics)
931.2 (Physical Properties of Gases, Liquids & Solids)
421 (Strength of Building Materials; Mechanical Properties)

22/9/12 (Item 3 from file: 23)
DIALOG(R)File 23: CSA Technology Research Database

0004953934 IP Accession No: 199509-58-1054
Fracture behavior of laser clad iron and nickel base alloy coatings on a cast iron under SEMI loading

Wang, A; Xie, C; Huang, K; Zhu, B; Tao, Z Huazhong University of Science and Technology
J. Mater. Sci. Technol. (China) (USA) , v 11 , n 3 , p 192-196 , June 1995
Publication Date: 1995
Publisher: Allerton Press, Inc. , 18 West 27th Street , New York , NY , 10001
Country Of Publication: USA
Publisher Url: http://www.allertonpress.com

Document Type: Journal Article
Record Type: Abstract
Language: English
ISSN: 1005-0302
Notes: Graphs; Photomicrographs; 3 ref., Graphs, Photomicrographs
No. Of Refs.: 3
File Segment: Metadex

Abstract:
Laser cladding technique has been applied to renovate some partially-damaged (or worn) components with Fe, Ni, Co-bsed alloys, hence to improve their hardness values and wear resistance successfully in previous reports. But for some punching or shearing cast iron dies damaged or worn in automobile manufacture, the renovated surfaces also bear some impact loading. Therefore, a small-energy and multi-impact (SEMI) test was designed to investigate the **fracture** behavior of renovated cast iron **dies** achieved by **laser** cladding of Fe and Ni-based alloys under SEMI loading to meet above requirement. Observations show that the **fracture** took place in the **substrate** near to the **substrate/coating** interface rather than at the interface. The tempering temperature has a great influence of the cycles to fracture of **laser**-clad samples under SEMI loading, i.e. the low tempering temperature of 300 deg C gives a maximum cycle to fracture, while a higher tempering temperature of 400 deg C has a minimum. Furthermore, the fracture mechanism has also been discussed in present study.

Descriptors: Journal article; Cast iron; Cladding; **Laser** processing; Claddings; Mechanical properties; Fracture strength; Medium carbon steels; Nickel base alloys
Subj Catg: 58, Metallic Coating
Material Class: SCM, Medium carbon steels; NI, Nickel base alloys
Materials: 40H; Ni 60

29/9/1 (Item 1 from file: 23)
DIALOG(R)File 23: CSA Technology Research Database

0005725054 IP Accession No: 200007-58-0960; 200006-P7-0270
Microstructure and multiple-impact response of the transition region between a laser-clad Fe-Al bronze coating and its aluminum alloy substrate

Wang, A; Xie, C; Li, S; Nie, J Huazhong University of Science and Technology
Xiyou Jinshu Cailiao yu Gongcheng (Rare Metal Materials and Engineering) (China) , v 28 , n 5 , p 289-292 , Oct. 1999
Publication Date: 1999
Publisher: Northwest Institute for Non-Ferrous Metal Research , Editorial Office of Rare Metal Materials and Engineering , Xi'an Shaanxi , 710016
Country Of Publication: China

Document Type: Journal Article
Record Type: Abstract
Language: Chinese
ISSN: 1002-185X
Notes: Graphs; Photomicrographs; Diffraction Patterns; 6 ref., Graphs, Photomicrographs, Diffraction Patterns; Graphs. Photomicrographs. Diffraction Patterns. 6 ref.
No. Of Refs.: 6
File Segment: Metadex; Aluminium Industry Abstracts

Abstract:
The microstructure and small energy multi-impact (SEMI) behavior of the transition region between a laser-clad Fe-Al bronze **coating** and its aluminum alloy **substrate** have been investigated. The results show that the transition region consists of several layers. The layer adjacent to the clad region is composed of non-uniform block-like Cu sub 9 Al sub 4 and Cu sub 3 Al phases. The middle layer is characterized by a mixed structure of block-like Cu sub 3 Al and needle-like CuAl sub 2 . In the layer near to the substrate the volume fraction of needle-like CuAl sub 2 phase decreases and volume fraction of alpha -Al phase increases when approaching to the **substrate**. Under SEMI loading, **cracks** initiate in the CuAl sub 2 phase-rich region. **Laser** scanning velocity has a significant influence on the volume fraction of CuAl sub 2 phase, and thus directly affects the SEMI resistance of the transition region. The laser-clad bronze coatings produced at a scanning velocity of 10 mm/s to 14 mm/s has better resistance to SEMI than those produced at higher scanning velocities.

Descriptors: Journal article; Aluminum base alloys; Cladding; Aluminum bronzes; Iron; Claddings; Laser beam cladding; Protective coatings; Microstructure; Grain structure
Subj Catg: 58, Metallic Coating; P7, Surface Treatment/Coating

29/9/2 (Item 2 from file: 23)
DIALOG(R)File 23: CSA Technology Research Database

0004559144 IP Accession No: 178745; 199308-57-1037; 2001-62-003918; 2001-62-001500
Fracture dynamics of sprayed and laser-glazed titania by an inverse processing of elastic waves

TAKEMOTO, M; NANBU, T; HAYASHI, Y AOYAMA GAKUIN UNIVERSITY
Journal of Thermal Spray Technology , v 2 , n 1 , p 69-78 , Mar. 1993
Publication Date: 1993
Publisher: ASM International , Member/Customer Service Center , Materials Park , OH , 44073-0002
Country Of Publication: USA
Publisher Url: http://www.asminternational.org
Publisher Email: cust-srv@asminternational.org

Document Type: Journal Article
Record Type: Abstract
Language: English
ISSN: 1059-9630
Notes: 18 fig.; Photomicrographs; Graphs; [See also Weldasearch 156064]; 12 ref., Photomicrographs, Graphs
No. Of Refs.: 12
File Segment: Weldasearch; Metadex; Civil Engineering Abstracts; Mechanical & Transportation Engineering Abstracts

Abstract:
A new elastic wave (EW) or acoustic emission (AE) monitoring and signal processing system has been developed and used to elucidate the fracture behavior of sprayed and laser-glazed ceramic coatings. The system measures the minute surface displacements excited by the propagation of elastic waves. it enables elucidation of the fracture dynamics (fracture mode and kinetics) of stressed coatings. The surface displacement at the sensor position was computed by the convolution integral of an assumed source wave with the dynamic Green's function until signals resembled the measured wave. This new signal processing method was used to determine the fracture strength and dynamics of microcracks in sprayed and laser-glazed titania subjected to four-point bending. It was found that mode II shear cracking along the interface between the coting and substrate occurred prior to mode I cleavage cracking. The fracture strength of laser-glazed titania was higher than that of as-sprayed titania in most cases; however, this depended on the coating structure. This article introduces the principle of source inversion processing of elastic waves, the monitoring system, **laser** glazing of sprayed titania, and experimental work on the **fracture** behavior of titania **coatings**. **Substrates** of 304 austenitic stainless steel were used.

Descriptors: Reference lists; Acoustic emission; Fracture tests; Sprayed coatings; Melting; Laser beams; Ceramic coatings; Titania; Flame spraying; Fracture toughness; Mechanical tests; Coatings; Radiation; Nonmetallic coatings; Ceramics; Oxides; Coating methods; Spraying; Mechanical properties; Toughness; Journal article; Austenitic stainless steels; Coating; Titanium dioxide; Coatings; Ceramic coatings; Mechanical properties; Sprayed coatings; Crack initiation; Crack propagation; Cleavage; Fracture toughness ; Fracture mechanics; Sound waves; Dynamics; Monitoring; Cracking (fracturing); Waves; Fracture strength; Excitation; Acoustic emission; Sprayers; Bend strength; Glazing; Lasers; Propagation; Microcracks; Kinetics; Computation; Sensors
Subj Catg: , TENSILE PROPERTIES, TOUGHNESS; SPRAYING; 57, Finishing; 62, Theoretical Mechanics and Dynamics; 62, Theoretical Mechanics and Dynamics
Material Class: SSA, Austenitic stainless steels
Materials: 304

II. Search Histories of multiple Databases

File 2:INSPEC 1898-2009/Nov W5
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File 256:TecTrends 1982-2009/Nov W5
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Set Items Description
S1 2402599 LASER???
S2 60394 HIGH(2N)ENERGY????(5N)(LIGHT?? OR BEAM??)
S3 142416 (WAFER?? OR SUBSTRATE?? OR DIE??)(5N)(LAMINAT???? OR COVER???? OR COATING??)

S4 24672 (CRACK??? OR MICROCRACK???? OR BREAK???? OR FRACTUR??? OR CRAZE?? OR CRAZING OR FLAW????)(5N)(WAFER?? OR SUBSTRATE?? OR DIE??)

S5 28839 (DEFECT????? OR IRREGULAR????? OR BROKEN)(5N)(WAFER?? OR SUBSTRATE?? OR DIE??)

S6 137439 (SUBSTRAT?? OR SEMICONDUCTOR?? OR SEMI()CONDUCTOR?? OR WAFER?? OR PRINT???()CIRCUIT??? OR IC OR CHIP??? OR PCB OR CIRCUIT??()BOARD??)(5N)(CRACK??? OR MICROCRACK???? OR BREAK???? OR FRACTUR??? OR CRAZE?? OR CRAZING OR FLAW???? OR DEFECT????? OR IRREGULAR????? OR BROKEN)

S7 57047 MULTI()PHOTON?? OR MULTIPHOTON??
S8 67483 CC= (A0660V OR A4262A OR B4360B OR B8620 OR C3355C OR E1520A)
S9 190110 (SUBSTRAT?? OR SEMICONDUCTOR?? OR SEMI()CONDUCTOR?? OR WAFER?? OR PRINT???()CIRCUIT??? OR IC OR CHIP??? OR PCB OR CIRCUIT??()BOARD??)(5N)(LAMINAT???? OR COVER???? OR COATING??)

S10 1 (S1 OR S2) AND (S3 OR S9) AND (S4 OR S5 OR S6) AND S7
S11 571 (S1 OR S2) AND (S3 OR S9) AND (S4 OR S5 OR S6)
S12 43 S11 AND S8
S13 43 RD (unique items)
S14 11 S13 NOT PY>2002
S15 428 S1 AND S3 AND (S4 OR S5)
S16 560 S1 AND S9 AND S6
S17 297 S1 AND S3 AND S4
S18 200 RD (unique items)
S19 614 S1(7N)S4
S20 69 S19 AND S18
S21 24 S20 NOT PY>2002
S22 17 S21 NOT S12
S23 686 S1(9N)S4 S25 362 S23/AB S26 53 S25 AND S3 S27 37
S26 NOT (S10 OR S12 OR S14 OR S21) S28 21 RD (unique items) S29 3
S28 NOT PY>2000

Dialog Foreign Patent Files:-

File 344:Chinese Patents Abs Jan 1985-2006/Jan
(c) 2006 European Patent Office
File 347:JAPIO Dec 1976-2009/Aug(Updated 091130)
(c) 2009 JPO & JAPIO
File 350:Derwent WPIX 1963-2009/UD=200976
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File 371:French Patents 1961-2002/BOPI 200209
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Set	Items	Description
S1	763667	LASER???
S2	10611	HIGH(2N)ENERGY????(5N)(LIGHT?? OR BEAM??)
S3	212759	(WAFER?? OR SUBSTRATE?? OR DIE??)(5N)(LAMINAT???? OR COVER???? OR COATING??)
S4	19231	(CRACK??? OR MICROCRACK???? OR BREAK???? OR FRACTUR??? OR CRAZE?? OR CRAZING OR FLAW????)(5N)(WAFER?? OR SUBSTRATE?? OR DIE??)
S5	23236	(DEFECT????? OR IRREGULAR????? OR BROKEN)(5N)(WAFER?? OR SUBSTRATE?? OR DIE??)
S6	40479	(SEMICONDUCTOR?? OR SEMI()CONDUCTOR?? OR PRINT???()CIRCUIT??? OR IC OR CHIP??? OR PCB OR CIRCUIT??()BOARD??)(5N)(CRACK??? OR MICROCRACK???? OR BREAK???? OR FRACTUR??? OR CRAZE?? OR CRAZING OR FLAW???? OR DEFECT????? OR IRREGULAR????? OR BROKEN)
S7	958	MULTI()PHOTON?? OR MULTIPHOTON??
S8	266980	(SUBSTRAT?? OR SEMICONDUCTOR?? OR SEMI()CONDUCTOR?? OR WAFER?? OR PRINT???()CIRCUIT??? OR IC OR CHIP??? OR PCB OR CIRCUIT??()BOARD??)(5N)(LAMINAT???? OR COVER???? OR COATING??)
S9	166	(S1 OR S2) AND S3 AND S4
S10	338	S1(9N)S4
S11	277	S10/AB
S12	27	S11 AND S3
S13	27	S12 NOT AD=03122002:12042009/PR
S14	13	S12 NOT AD=20020312:20091204/PR
S15	274	S1 AND S6 AND S8
S16	719	S1(7N)S6
S17	574	S16/AB
S18	55	S17 AND S8
S19	47	S18 NOT S12
S20	23	S19 NOT AD=20020312:20091204/PR
S21	64860	(FORM??? OR CREAT???? OR CONFIGUR? OR GENERAT?)(7N)(CRACK?? OR MICROCRACK?? OR FRACTUR? OR CRAZ???)
S22	603	S1(9N)S21
S23	445	S21 AND S3 AND S4
S24	18	S22 AND S3 AND S4
S25	10	S24 NOT (S12 OR S20)
S26	3	S25 NOT AD=20020312:20091204/PR
S27	344	AU=(FUKUYO F? OR FUKUYO, F? OR FUKUMITSU, K? OR FUKUMITSU K?)
S28	2	S27 AND S1 AND S3 AND S4
S29	10	S27 AND S1 AND S3
S30	2	S29 AND S4